

# BUREAU OF WATER

## Ocean Water Quality Monitoring Program Procedure for Issuing Swimming Advisories



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South Carolina Department of Health  
and Environmental Control

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# **OCEAN WATER QUALITY MONITORING PROGRAM**

## **Procedure for Issuing Swimming Advisories**

### INTRODUCTION

A significant feature of South Carolina's public beaches is the physical geography of the coastline. The land mass contacts directly with the Atlantic Ocean with very little freshwater input from rivers and streams, or pollution sources other than direct storm water runoff. During the summer of 1996 there was increased interest by the Department in the water quality of South Carolina's ocean beaches, especially in the Grand Strand area. A report by the Natural Resources Defense Council and articles in local newspapers sparked criticism because South Carolina did not have a program to monitor its ocean water quality and advise swimmers appropriately. There are many reasons why it was thought that South Carolina did not need an intensive or extensive monitoring program for ocean water quality:

- All fresh and salt waters in South Carolina are classified such that any permitted discharge into these waters is treated sufficiently to protect the health of swimmers.
- Unlike those states with extensive ocean monitoring programs, South Carolina does not have offshore dumping of garbage or sewage sludge.
- South Carolina has no sewage discharges into or adjacent to the surf. There was a time when there were many small sewage treatment plants dotted along the coast of South Carolina and each discharged to the ocean. Over the last 15 to 20 years these small wastewater treatment plants have been replaced by larger regional plants that provide better treatment, are more reliable, and do not discharge to the ocean. There is also better and more reliable infrastructure.

### HISTORICAL PERSPECTIVE

Until 1980, the Department collected water quality samples from the surf. There were 19 stations: 16 in the Grand Strand area; and one each at Folly Beach, Sullivan's Island, and Isle of Palms. Samples were collected once per month during the months of May through October. A review of the data collected for the final 5 years of sampling shows no indication of violations of the State water quality standard for swimming. When the Department stopped sampling the surf stations, there were new initiatives to monitor nonpoint source pollution statewide, and resources were focused there. While the surf data were useful for determining overall water quality, they were not useful for advising swimmers, due to the monthly sampling protocol. During 1991-1993 the United States Geological Survey monitored Withers Swash in Myrtle Beach, tributaries to it, and the ocean near the swash for fecal coliform bacteria. The study showed increased levels of bacteria during wet periods. The monitoring in the ocean

was limited, but did not show a persistent problem. Bacteria were elevated in the surf at the immediate confluence with Withers Swash, but were at acceptable levels 70- 100 feet on either side of the Swash. This suggested dilution and dispersion of the storm water and its contaminants.

South Carolina has no sewers that combine storm water with wastewater, a situation common in many states, which leads to greater contamination of storm water. South Carolina does have a number of storm drains that discharge to the beach, but over the last ten years State and local storm water controls have minimized inputs. New storm water outfalls to beaches are now prohibited. Also, several municipalities in the Grand Strand area have street sweeping programs to minimize inputs into storm water.

### HEALTH RISKS

The most common outcome measure in relation to swimming in potentially contaminated ocean water is acute gastroenteritis and diarrhea from accidental ingestion. While respiratory and other infections are possible, the likelihood of acquiring certain potentially serious pathogens such as Salmonella typhi and poliovirus is extremely low to non-existent in US coastal waters. Most illnesses associated with swimming are neither protracted or life-threatening, but can result in discomfort, inconvenience, and potentially significant direct and indirect medical costs. No studies have been conducted on South Carolina ocean water to relate bacteria densities with actual incidence of swimmer illness. Although not everyone will become ill after swimming in contaminated water, the risk of illness has been correlated with increasing bacteria densities.

### INDICATOR ORGANISM

Bacteria densities are used as indicators of the presence of pathogens, or disease-causing organisms, in water. According to the U.S. Environmental Protection Agency (EPA), enterococcus bacteria, also called fecal streptococci or Group D streptococci, is the best indicator for the pathogens that may be present in ocean water; therefore, many states use enterococcus as the indicator organism for ocean water quality sampling.

For swimming in ocean water, EPA recommends a geometric mean of no more than 35 enterococcus bacteria per 100 milliliters of water. EPA believes that this limit is appropriate and represents an acceptable level of risk. The limit is intended for comparison with the geometric mean of a statistically significant number of samples: at least five samples equally spaced over a 30-day period.

EPA also recommends setting a single-sample maximum based on the intensity of beach use and observed local variability in bacteria densities. This single-sample limit is more appropriate

to use for swimmer advisories than the geometric mean, since results can be reported within 24 hours of sampling. As an example, EPA calculated a limit of 104 enterococcus bacteria per 100 milliliters of water for a heavily used, (*bacteria*) sewage-contaminated beach during dry weather. For the same beach used infrequently, the calculated limit was 500 enterococcus bacteria per 100 milliliters of water.

The Enterolert Quantitray analysis is used in the ocean water quality monitoring program. This method is chosen as a rapid and simple means of identifying *Enterococcus sp.* presence in coastal waters. This method has been recognized by EPA as an acceptable method in these determinations.

### CURRENT MONITORING PROGRAM

A study to determine levels of bacteria in the ocean water of South Carolina beaches under varying site and environmental conditions was conducted in 1997. Because of the logistics of sampling, holding times for samples, laboratory space, and funding, DHEC could not conduct the sampling but developed a model sampling plan. One sampling site was selected for each two to three miles of beach, and one each at the furthest reaches of accessible beach within each participant's jurisdiction. In areas with swashes or storm water discharges to beach or surf, sites at their confluence with the ocean, and 100 feet on either side, were selected. At a minimum, the two sites with highest estimated storm flows in each municipality or jurisdiction were included. Ocean water samples were collected in waist-deep water from approximately one foot depth.

Since 1997, various municipalities and counties along the coast have developed their own monitoring programs throughout the swimming season. DHEC's monitoring initiative is to enhance and expand the coverage of these local programs.

In 1998 the SC General Assembly allocated some non-recurring funds to DHEC for ocean water quality monitoring. The current DHEC sampling program was initially intended to be divided into three lots representing the three Environmental Quality Control Districts along the South Carolina coast (**See Attachment A**):

- Waccamaw Coastal District includes the coastline of Horry and Georgetown Counties (48 sites).
- Trident Coastal District includes the coastline of Charleston County (38 sites).
- Low Country Coastal District includes the coastline of Colleton, Beaufort, and Jasper Counties (36 sites).

Because the funding for the program was non-recurring, the monitoring during the first year had to be conducted through contract vendors. After DHEC initially qualified two offeror's through a request for proposal (RFP) process, only one, Coastal Carolina University's Environmental Quality Lab, submitted a bid for the sampling contract. Based on their

experience with previous coastal sampling efforts with the City of Myrtle Beach, they were given responsibility for sampling in the Waccamaw Coastal District. Coastal Carolina University expressed interest in sampling other areas, but procurement and sample holding time did not allow for that.

Presently, routine samples are collected according to the following schedule (Waccamaw only):

January -	1 sample per site
February -	1 sample per site
March -	1 sample per site
April -	1 sample per site (2 per site beginning in 2000)
May -	2 samples per site (every other week)
June -	2 samples per site (every other week)
July -	2 samples per site (every other week)
August -	2 samples per site (every other week)
September -	2 samples per site (every other week)
October -	2 samples per site (every other week)
November -	1 sample per site
December -	1 sample per site

If a sample results in the exceedence of the 104 Enterococci/100 milliliters from a single sample site, a repeat sample must be collected within 24 hours.

Non-routine sampling will also be conducted to determine trends and sources of contamination.

When significant rainfall occurs within 24 hours and has been immediately (within 36 hrs) preceded or is followed by at least a half (0.5) inch of precipitation, sampling will be conducted in the affected area(s) as soon as practical. Rain gages will be established in relevant areas and their readings used to help determine when conditions warrant sampling.

### ADVISORY PROTOCOL

#### 1. Permanent Intervention Actions:

- a. Public education - Steps should be taken to inform beach users about potential problem areas existing at specific beach locations. Many vacationers do not see or hear advisories reported in the local news media. The best method is to post advisories on the beach. Immediately following periods of significant rainfall, particularly following a dry weather period, the ocean water in the areas adjacent to swashes and storm drain discharge points tend to show elevated levels of enterococcus bacteria. The data collected to date in 1999 support the posting of permanent signs at specific beach

swashes and storm drain outfalls. Further monitoring is needed to identify other impacts and rain event triggers.

The following is suggested language (red or black letters on white) for these permanent notices in swashes:

**CAUTION**

*Following rainfall, this area may have elevated levels of bacteria due to storm water runoff. Swimming is not recommended within 100 feet in each direction. Wading, fishing, and shell collecting do not present a risk. For more information, contact (local jurisdiction) or the SC Department of Health and Environmental Control*

Children often play in runoff from storm drains on the beach, which also show elevated bacteria levels following rainfall. These should be identified as areas for swimmers to avoid.

The following is suggested language (red or black letters on white) for permanent notices affixed to storm water outfalls:

*This Is a Storm Water Pipe*

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**CAUTION**

*Swimming or Playing in Storm Water Runoff on the Beach is NOT Recommended. Wading, fishing, and shell collecting do not present a risk. For more information, contact (local jurisdiction) or the South Carolina Department of Health and Environmental Control*

In addition, signage could be placed adjacent to public accesses to the beaches that would provide a general advisory related to swimming immediately following rain events. The following is suggested language (red or black letters on white) for signs at public access points:

**CAUTION**

*Swimming immediately after rainstorms or Playing in Storm Water Runoff on the Beach is NOT Recommended. Wading, fishing, and shell collecting do not present a risk. For more information, contact (local jurisdiction) or the South Carolina Department of Health and Environmental Control*

All signs need to be appropriately sited to ensure notification to beach patrons.

b. Provide a permanent ocean water quality advisory slide on the local cable channel to help notify the public of potential elevated bacteria counts and provide a local

information contact telephone number.

c. Provide ocean water quality advisory updates at central municipal government locations.

d. Provide general ocean water quality information, i.e., brochures (**see Attachment B**) at businesses such as hotels, restaurants, campgrounds, and property management companies (to reach rental customers).

e. Provide a “toll free” number that could update the caller on ocean water quality conditions. This number could be administered through the Chambers of Commerce (Myrtle Beach, Charleston, etc) or local government offices.

f. Provide water quality information on local webpages, updated with current information.

## 2. Criteria and Notification:

Timely notification to beach users of elevated bacteria levels is crucial during the swimming season. The need for advisories during the months of November through March will be made on a case by case basis depending on usage. Municipalities conducting their own monitoring should notify the public by posting signs or through other appropriate means when sample results indicate elevated bacteria levels. The Department will notify the affected municipalities when DHEC sampling results indicate elevated bacteria levels are present or when rain event patterns meet established criteria (see Future Goals Section) for predictable elevated bacteria levels. If the municipal government is unable to issue a timely advisory, the Department will issue the appropriate advisory.

### a. Site Specific Posting - Sites will be posted:

(i) If a routine sample results in the exceedence of the 104 Enterococci/100 milliliters from a single sample site, a repeat sample must be collected within 24 hours. If the repeat sample also exceeds 104 Enterococci/100 milliliters, the EQC District Office staff will then notify the appropriate community representatives.

(ii) If any single routine sample exceeds 500 Enterococci/100 milliliters of water, the appropriate community representatives will also be notified.

In either case, the affected area will be posted with temporary advisory signage only, conspicuously on the beach adjacent to the affected area. Media advisories will not be the normal or preferred way to notify the public. The issuance and retraction of any DHEC sign postings or advisories can only be performed by the appropriate EQC District Director or his designee.



The following is suggested language (white letters on red) for these temporary advisory signs:

**SWIMMING ADVISORY ISSUED FOR THIS AREA**

*A Swimming Advisory Has Been Issued By (local jurisdiction) and  
The SC Department of Health and Environmental Control for This Section  
of Beach. High Bacteria Levels Have Been Detected In This Section  
of The Beach, and Swimming Is NOT Advised Until Bacteria Levels  
Return to Normal*

b. Widespread or Numerous Stations - If follow-up sampling confirms that the affected areas are widespread or if initial sampling indicates a number of adjacent sites that exceed by more than ten percent the 104 Enterococci/100 milliliters of water, the EQC District Office staff will then notify the appropriate area(s) representatives and the affected area will be posted with temporary advisory signage, conspicuously displayed on the beach adjacent to the affected area. Media advisories may also be issued based on the extent of the affected area and the effectiveness and timeliness of posting. The issuance and retraction of any DHEC advisory or sign postings can only be performed by the appropriate EQC District Director or his designee.

c. General Advisory - Due to the time required for analyses, it may not be protective of public health under certain circumstances to wait on analytical results. When an extreme weather event, such as a hurricane, tropical storm, or torrential rain occurs, a general advisory may be issued without current sampling data. It is known that significant rainfall within a 24 hour period causes elevated bacteria counts that exceed the advisory action levels. After notification to the appropriate area(s) representatives, the affected area will be posted with temporary advisory signage, conspicuously displayed on the beach adjacent to the affected area. Media advisories will also be issued. The issuance and retraction of any DHEC advisory or sign postings can only be performed by the appropriate EQC District Director or his designee.

**FUTURE GOALS**

The data collected to date in 1999 support the posting of permanent signs at specific beach swashes and storm drain outfalls. Monitoring will be conducted in the other two districts beginning in state fiscal year 2000. In future years, it is hoped that resources will allow for weekly sampling at all stations in the months of May through September. Further monitoring is needed to identify other impacts and rain event triggers. After significant sampling has been achieved, it may be possible to make predictions about surf contamination based on trend data. This involves looking at the principal factors of rainfall amounts, outfall or swash location, tidal influences, and prevailing winds. Modeling could be effectively used to predict the areas to post, and possibly, the duration of the posting. Investigations also need to be conducted to identify bacteria contributions to the storm water.

## Attachment A

### Ocean Water Quality Monitoring Sites

#### Waccamaw District

Horry County	37
Georgetown County	11
<b>Subtotal</b>	<b>48</b>

#### Trident District

Sullivans Island & Isle of Palms	10
Folly Beach	8
Kiawah & Seabrook Islands	15
Edingsville Beach & Botany Bay Island	5
<b>Subtotal</b>	<b>38</b>

#### Low Country District

Edisto Beach	7
Hunting & Fripp Islands	14
Port Royal	1
Hilton Head Island	14
<b>Subtotal</b>	<b>36</b>

<b>Total</b>	<b>122</b>
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